Human cardiomyogenesis and the need for systems biology analysis.

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Public Summary:
Cardiovascular disease remains the leading cause of death in the Western world and myocardial infarction is one of the primary facets of this disease. The limited natural self-renewal of cardiac muscle following injury and restricted supply of heart transplants has encouraged researchers to investigate other means to stimulate regeneration of damaged myocardium. The plasticity of stem cells toward multiple lineages offers the potential to repair the heart following injury. Embryonic stem cells have been extensively studied for their ability to differentiate into early cardiomyocytes, however, the pathway has only been partially defined and inadequate efficiency limits their clinical applicability. Some studies have shown cardiomyogenesis from adult mesenchymal stem cells, from both bone marrow and adipose tissue, but their differentiation pathway remains poorly detailed and these results remain controversial. Despite promising results using stem cells in animal models of cardiac injury, the driving mechanisms behind their differentiation down a cardiomyogenic pathway have yet to be determined. Currently, there is a paucity of information regarding cardiomyogenesis on the systemic level. Stem cell differentiation results from multiple signaling parameters operating in a tightly regulated spatiotemporal pattern. Investigating this phenomenon from a systems biology perspective could unveil the abstruse mechanisms controlling cardiomyogenesis that would otherwise require extensive in vitro testing.

Scientific Abstract:
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